NRCC
Northern Rockies Coordination Center

PREDICTIVE SERVICES

Predictive Services Northern Rockies

Wildland Fire Forecasting: Current Conditions, Trends, and Coordination

Governor's Drought and Water Supply Advisory Committee Meeting

22 July, 2019

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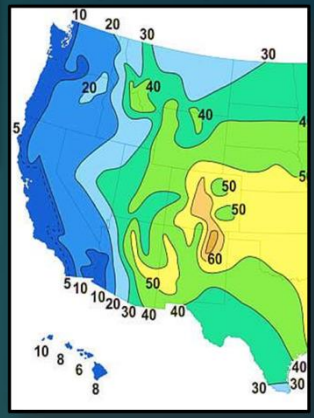
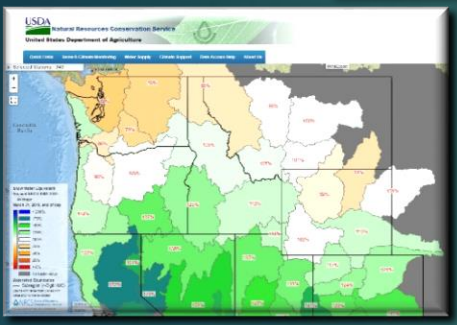
Factors that Influence NRGA/MT Fire Season

*Snowpack melting rates are much more important than snow pack accrual!

Number of Thunderstorm Days/Year (NOAA)





Spring Factor

July Temperatures and Precipitation

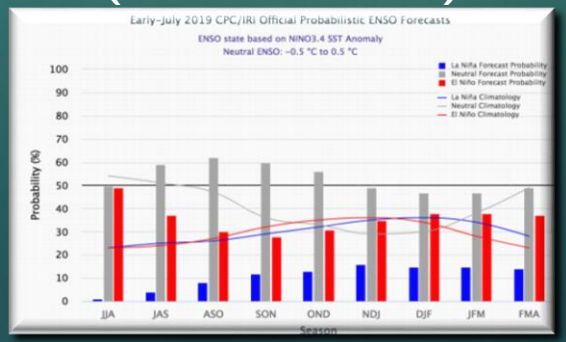
Near to Below-average temps/Slight Dryness North ID/Western MT so far…

Above-average precip Central MT east to ND…

Summer Convection

Winter Snowpack

Ocean/Atmospheric Circulations (ENSO/PDO/etc.)



Weak El Nino in place, transitioning to ENSO neutral by fall. Persisting through Winter.

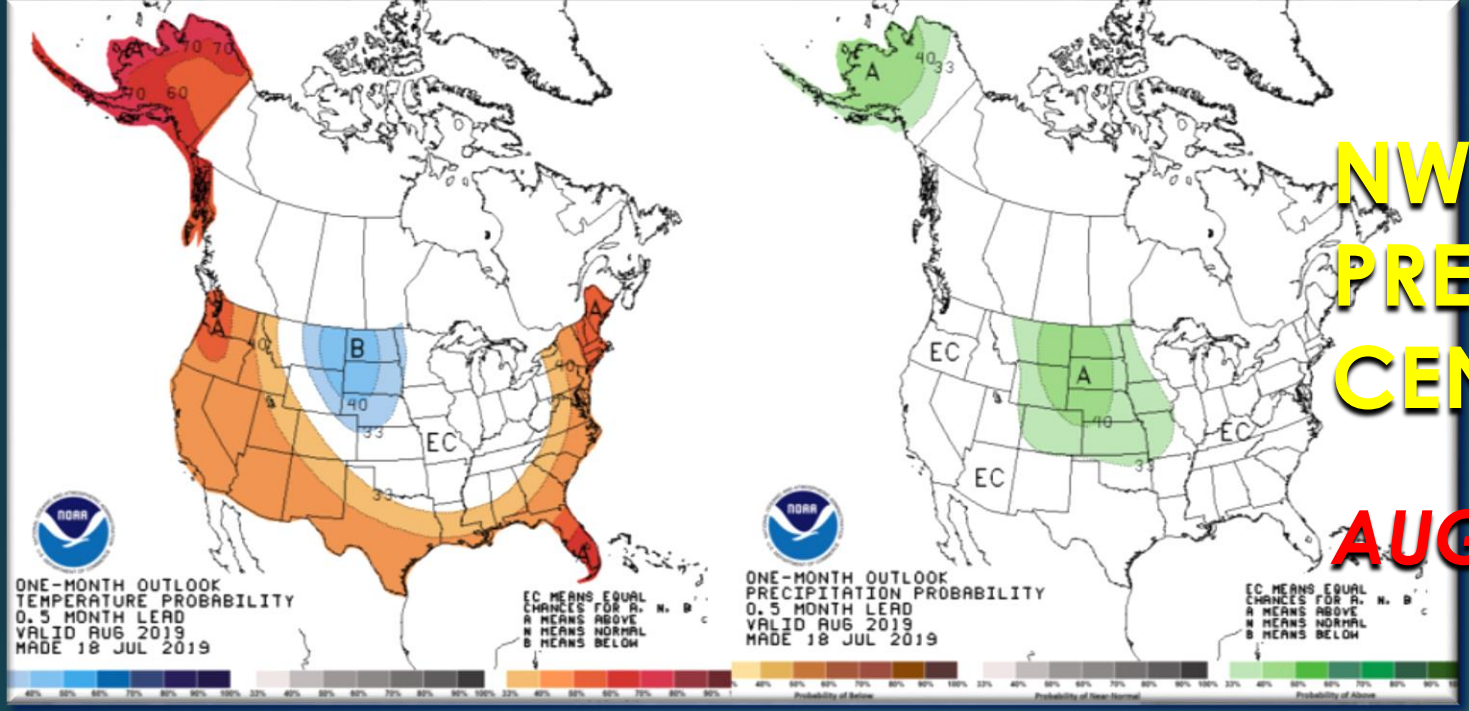
Start - Fall

Fall /Winter precip Below-average across North ID/NW MT

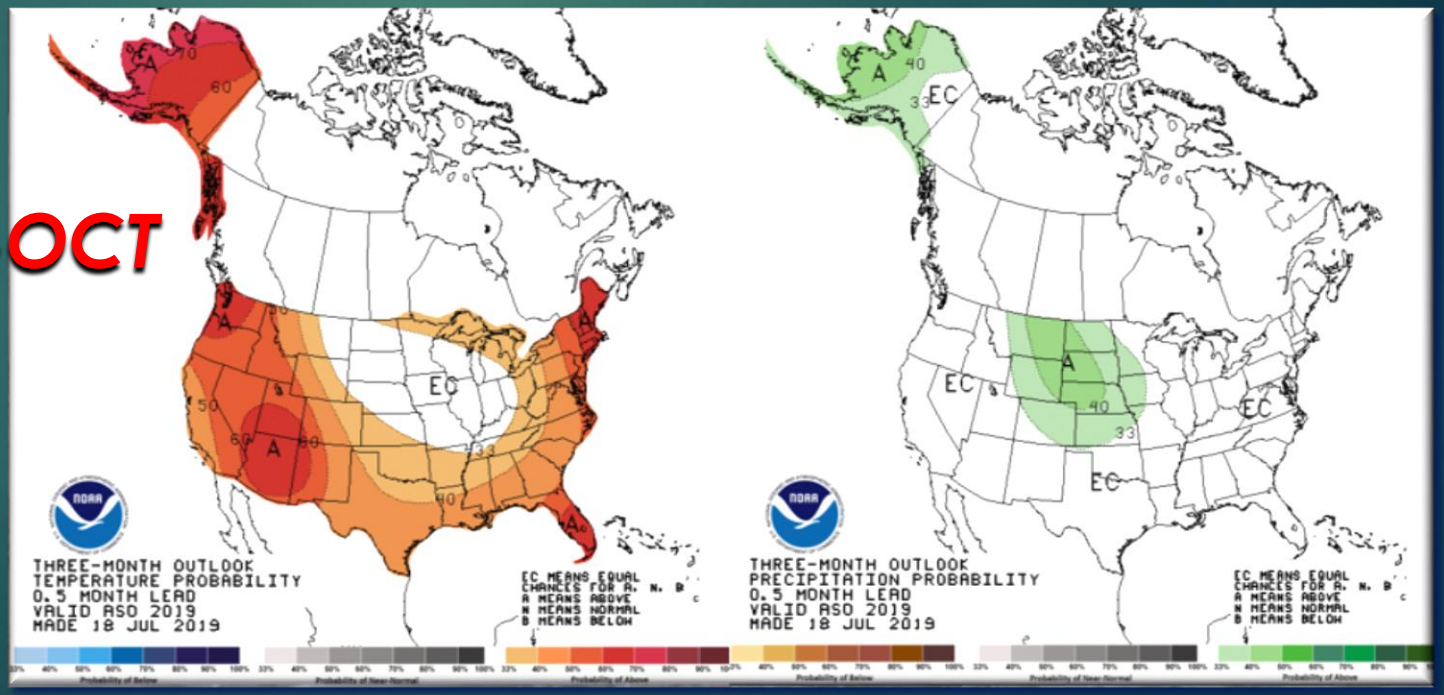
Above-average much of S-Central/SE MT. Patchy dry areas in North Dakota.

NWS CLIMATE PREDICTION CENTER

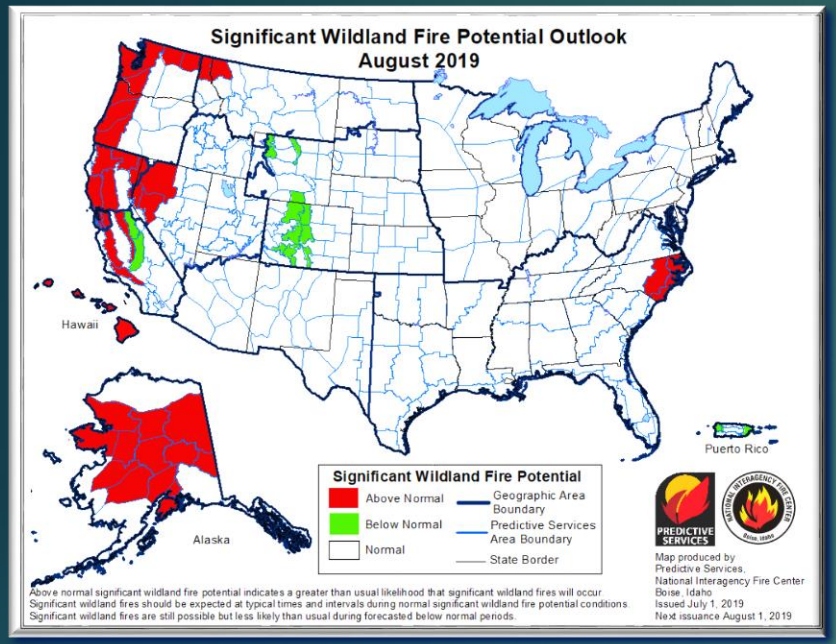
AUG OUTLOOK

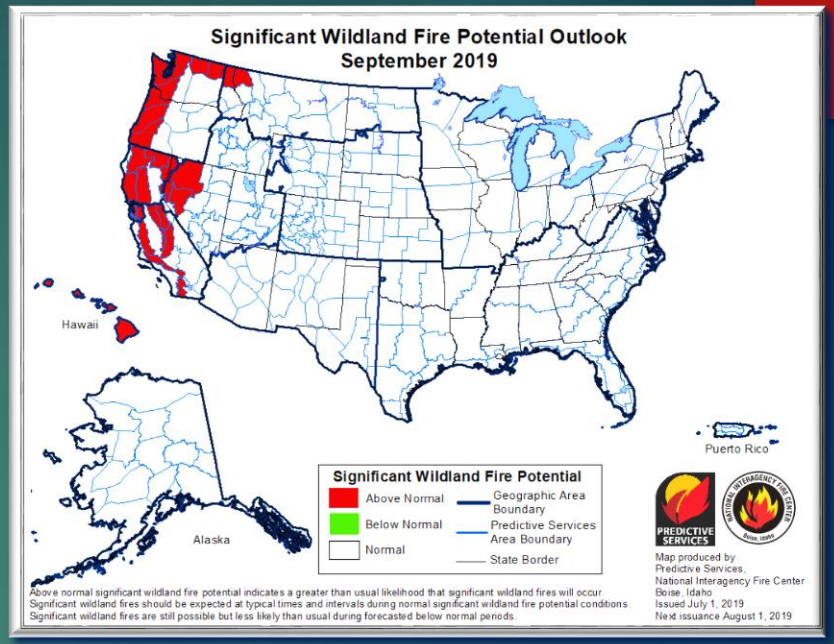


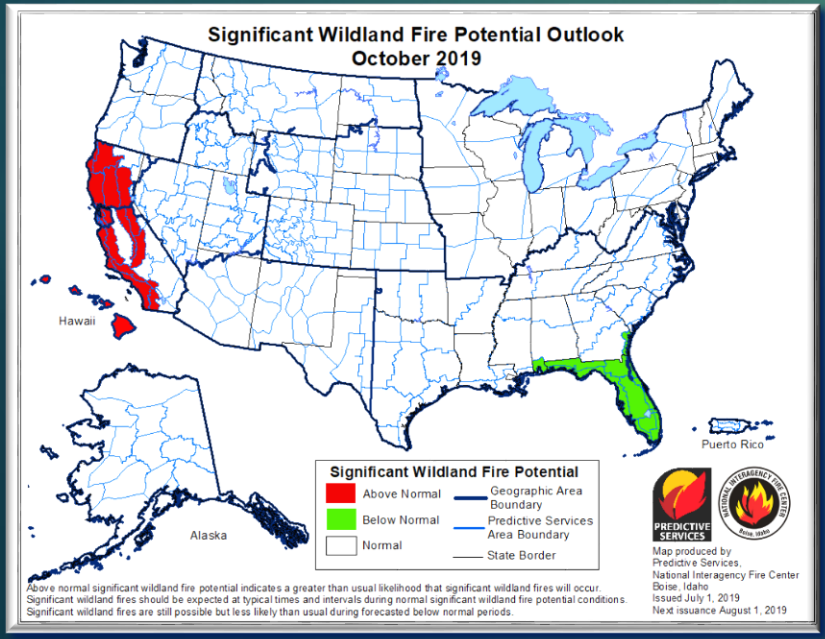
AUG-SEPT-OCT OUTLOOK



Current Monthly Outlooks







Latest Thinking….

Cool but dry June/July – Fine Fuels (grass) curing set back about 2-3 weeks most areas.

Driest areas in NW Montana are carryover from 2018

Very weak El Nino transitioning to ENSO Neutral may help bring more heat in August west of the Continental Divide

Above average temperatures through fall, even with average precip. would prolong season well into Oct., but easing in November.

Wildland Fire Forecasting: The Role of Predictive Services

- Established in 2001
- Decision-support for fire management
- National Unit in Boise
- 10 Geographic Area units

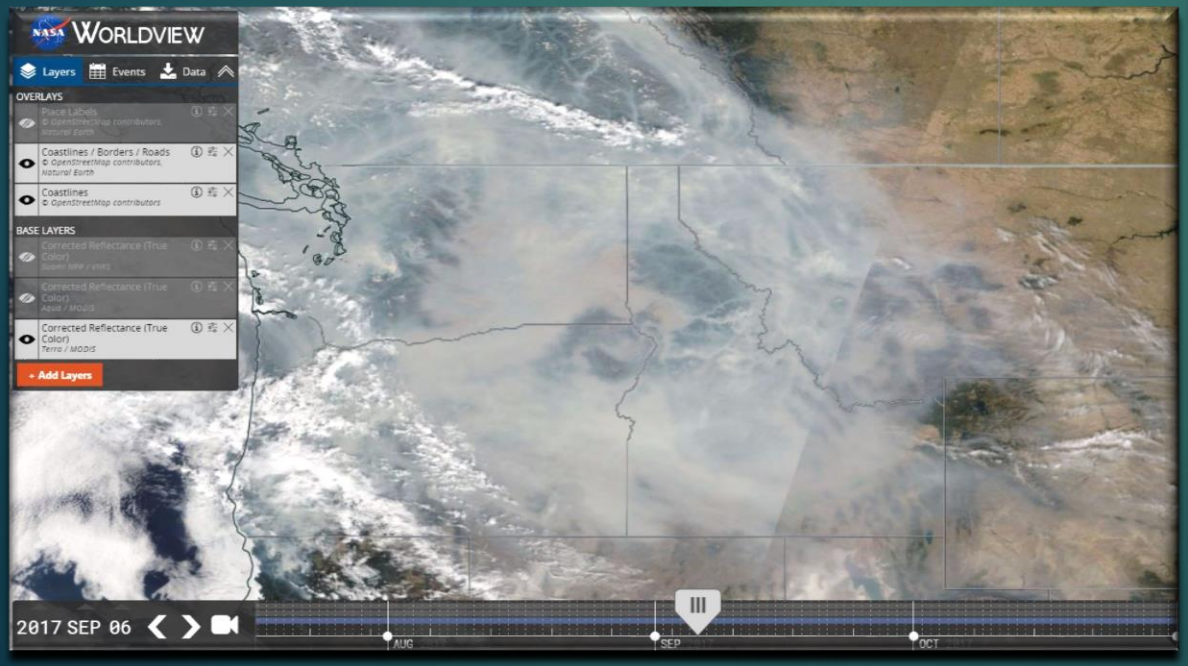
  "GACCs"
- ~ 20 meteorologists
- 3 Fire Analysts

- 3 primary functions:
  - Fire weather and climate
  - Fuels and fire danger
  - Intelligence (Fire activity/resources)

PREDICTIVE SERVICES

Wildland Fire Forecasting: Variables We Forecast/Predict/Measure

- Moisture/Dryness
- Lightning Ignitions
- Spread of Fires = WIND
- Smoke Dispersion

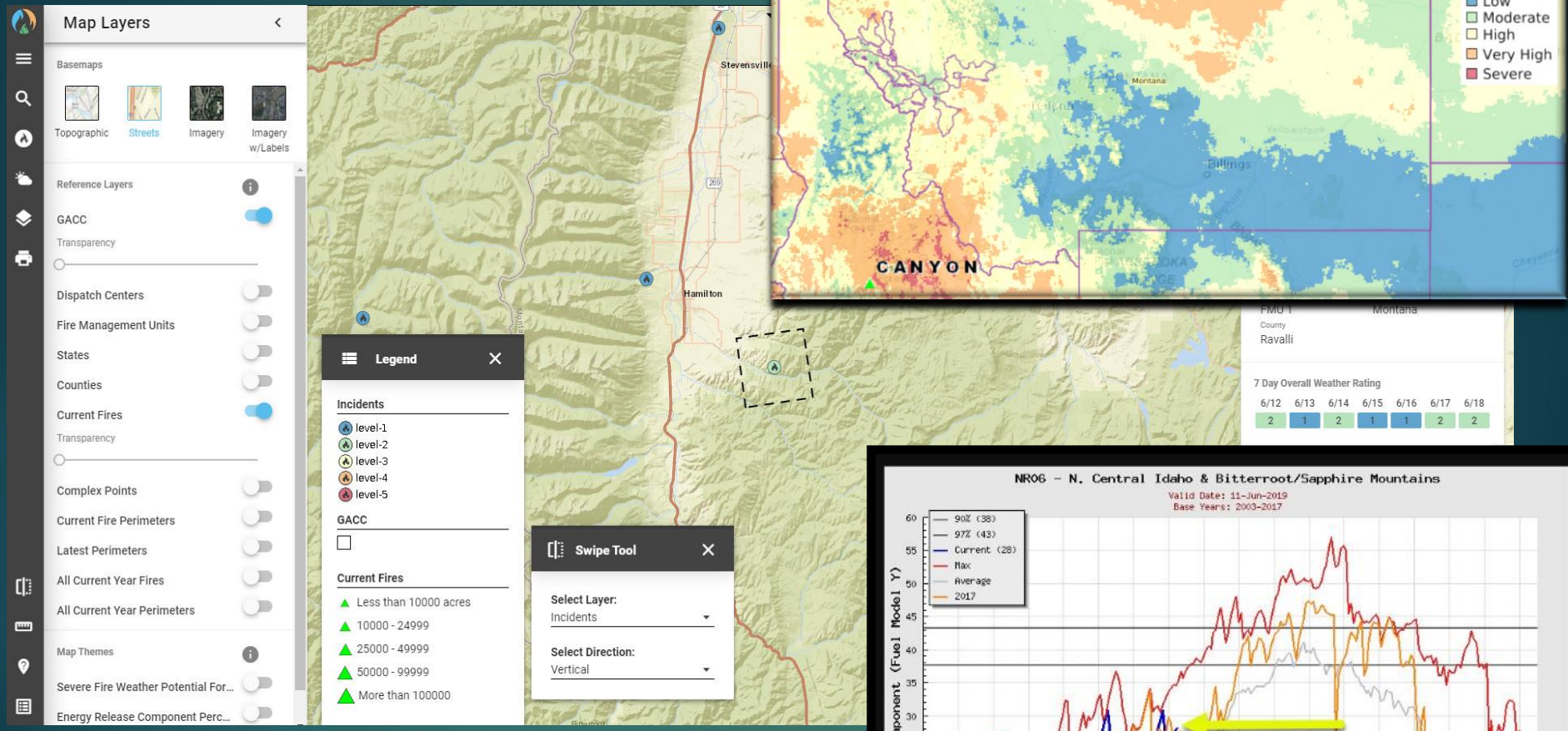


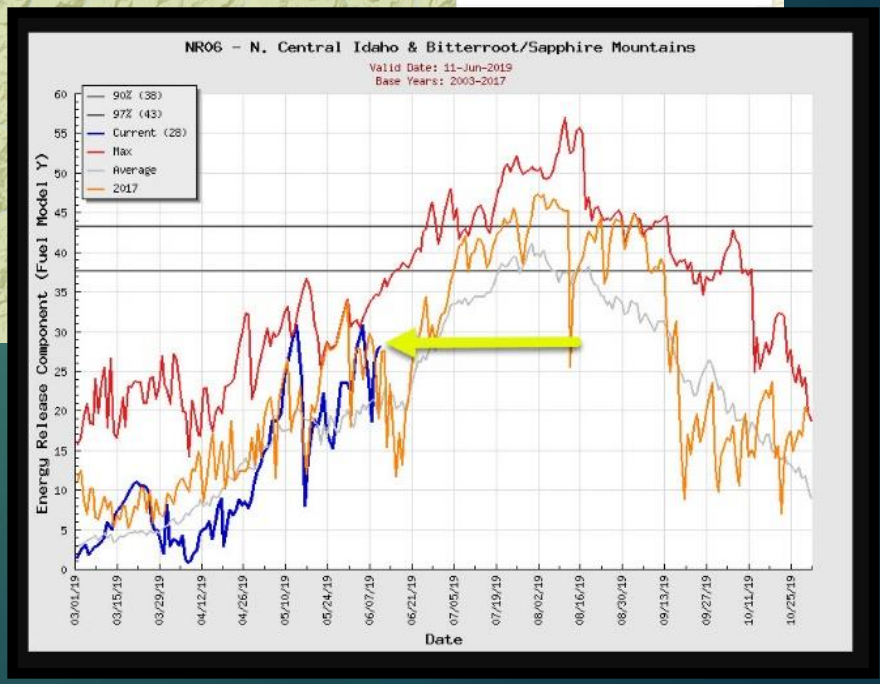
Wildland Fire Forecasting: Variables We Forecast/Predict/Measure

- Background Dryness – Underlying Potential based on the state of the:
  - Vegetation "FUELS" – both live and dead
  - Soil
  - Air (RH%)

MOISTURE

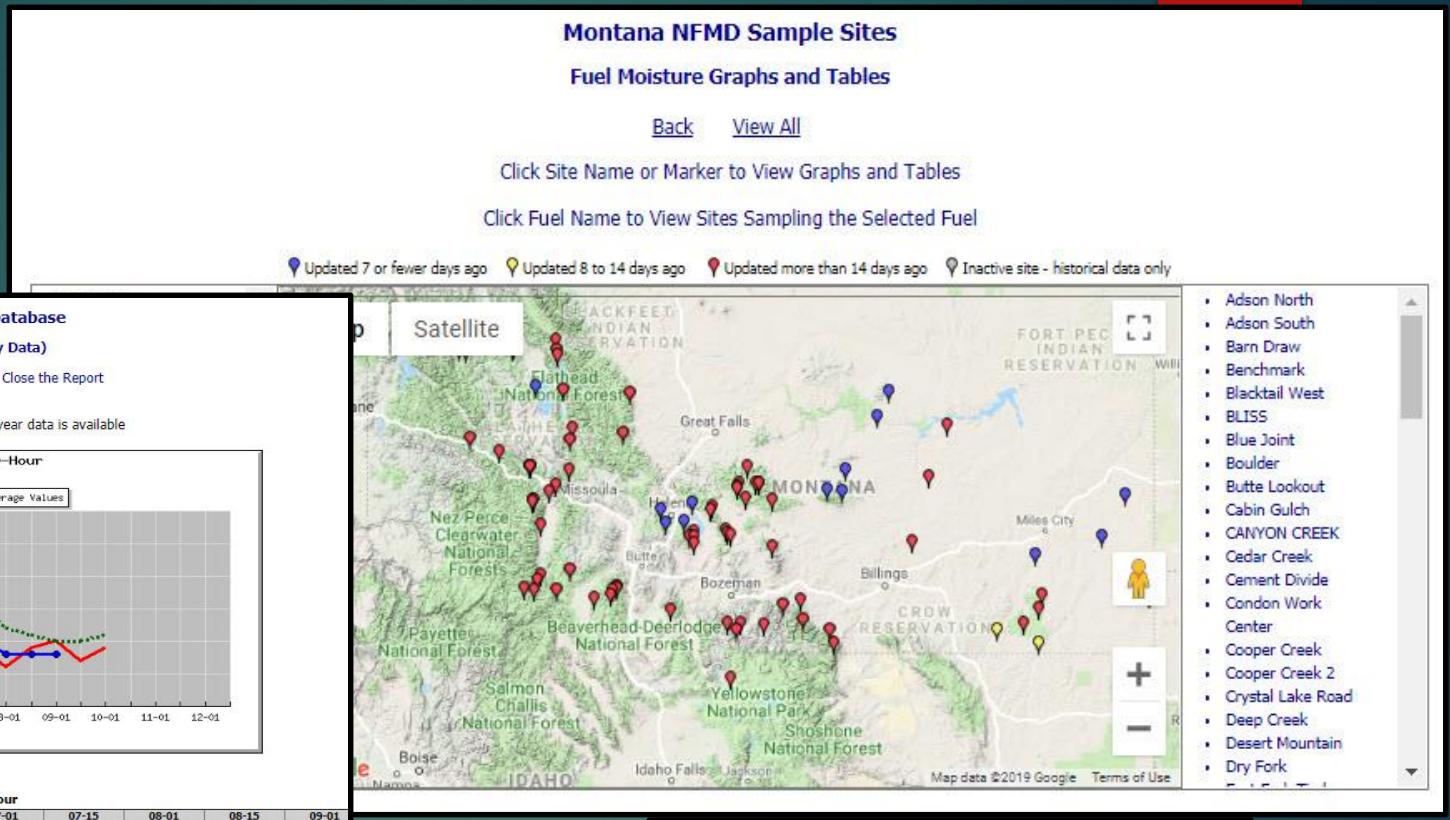
Fuels/Fire Danger Assessment and Trends

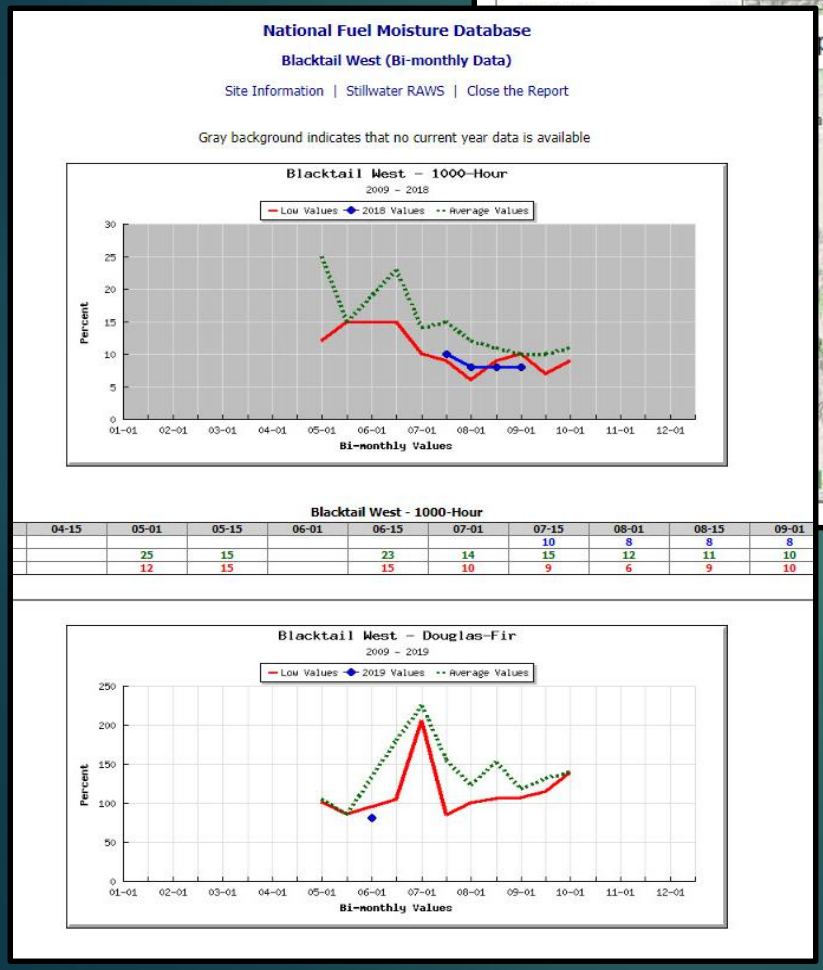




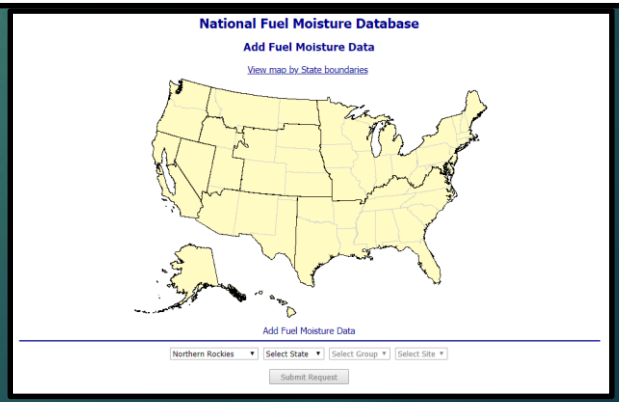
- WFAS Severe Fire Weather Potential
https://wfsafe.technosylva.com/pro

National Fuel Moisture Database





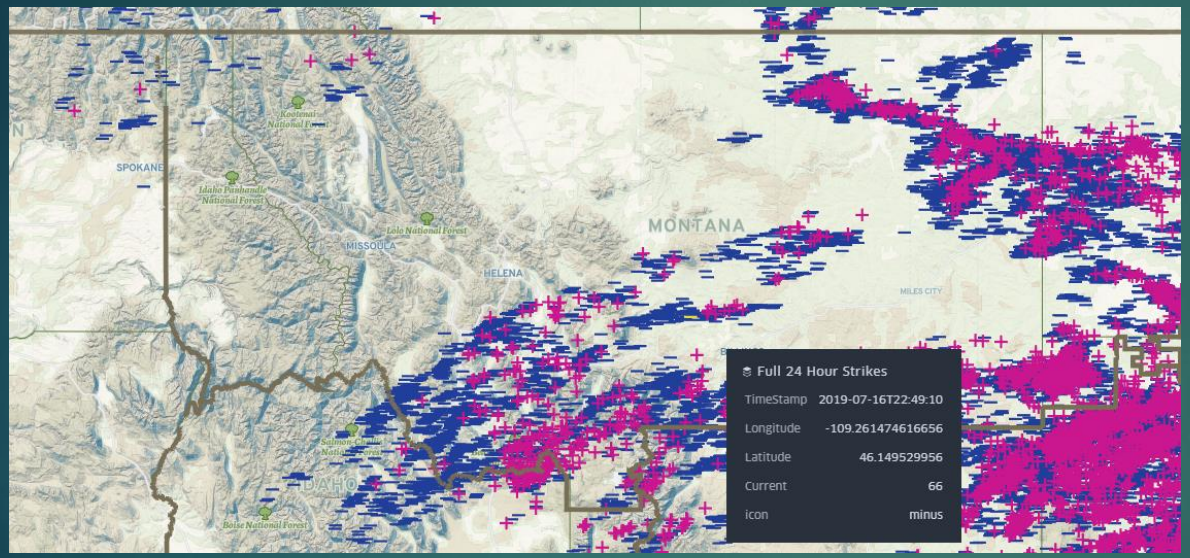
04-15	05-01	05-15	06-01	06-15	07-01	07-15	08-01	08-15	09-01
						10	8	8	8
	25	15		23	14	15	12	11	10
	12	15		15	10	9	6	9	10



PREDICTIVE SERVICES

Wildland Fire Forecasting: Variables We Forecast/Predict/Measure

- Lightning Ignitions – 80% of all fire starts
- 10 a.m. rule "Get 'em while they're small"



LIGHTNING

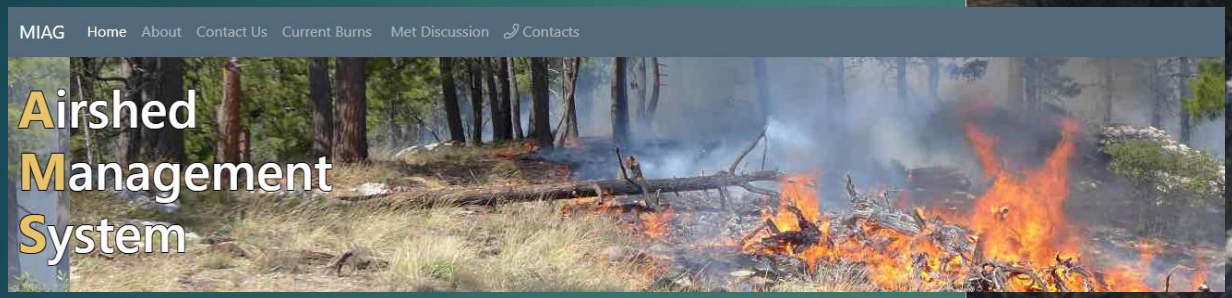
Wildland Fire Forecasting: Variables We Forecast/Predict/Measure

- **Magnitude** affects rate of spread and drying out of fuels
- **Direction** affects where the fire is going

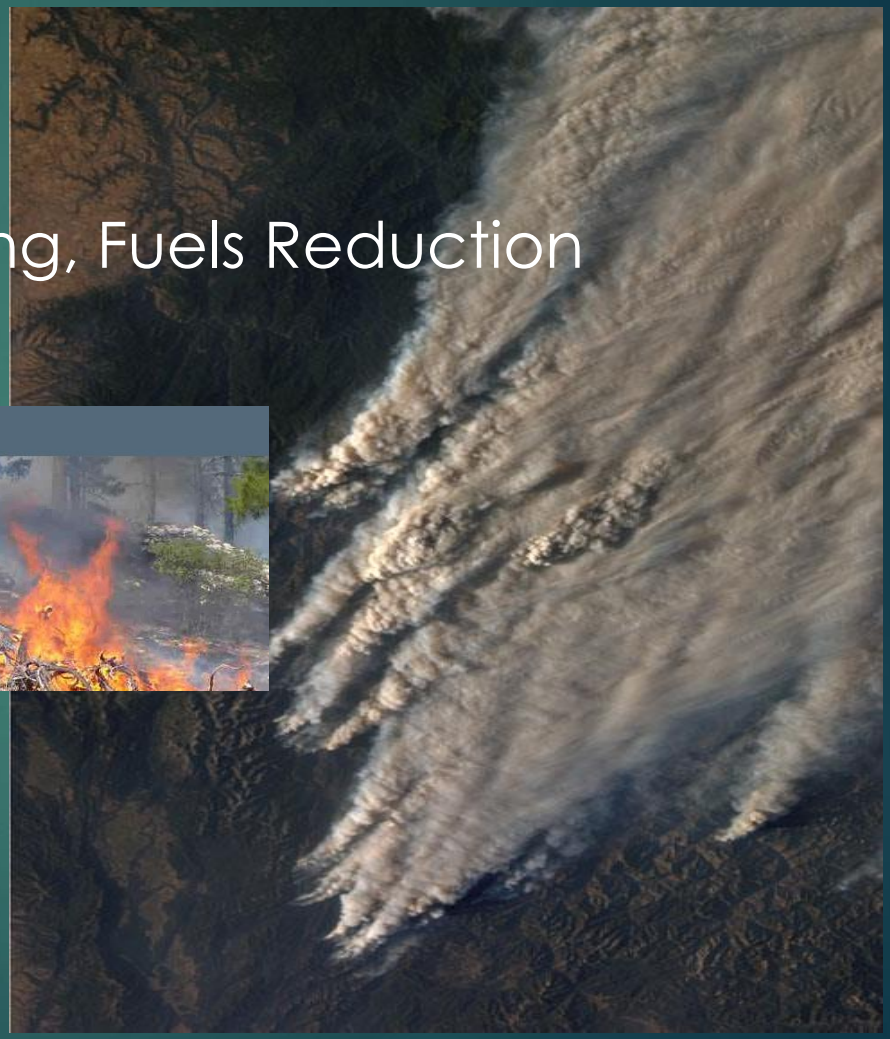
WIND

Wildland Fire Forecasting: Variables We Forecast/Predict/Measure

- Impacts to sensitive areas
- Opportunities for RX Burning, Fuels Reduction

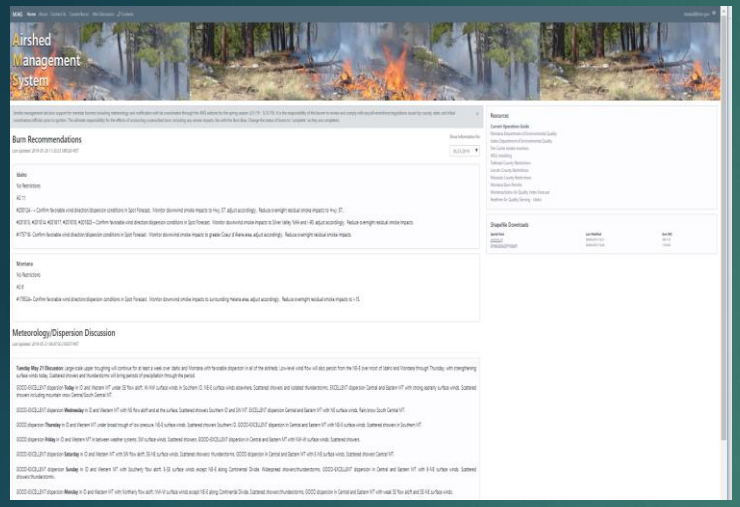


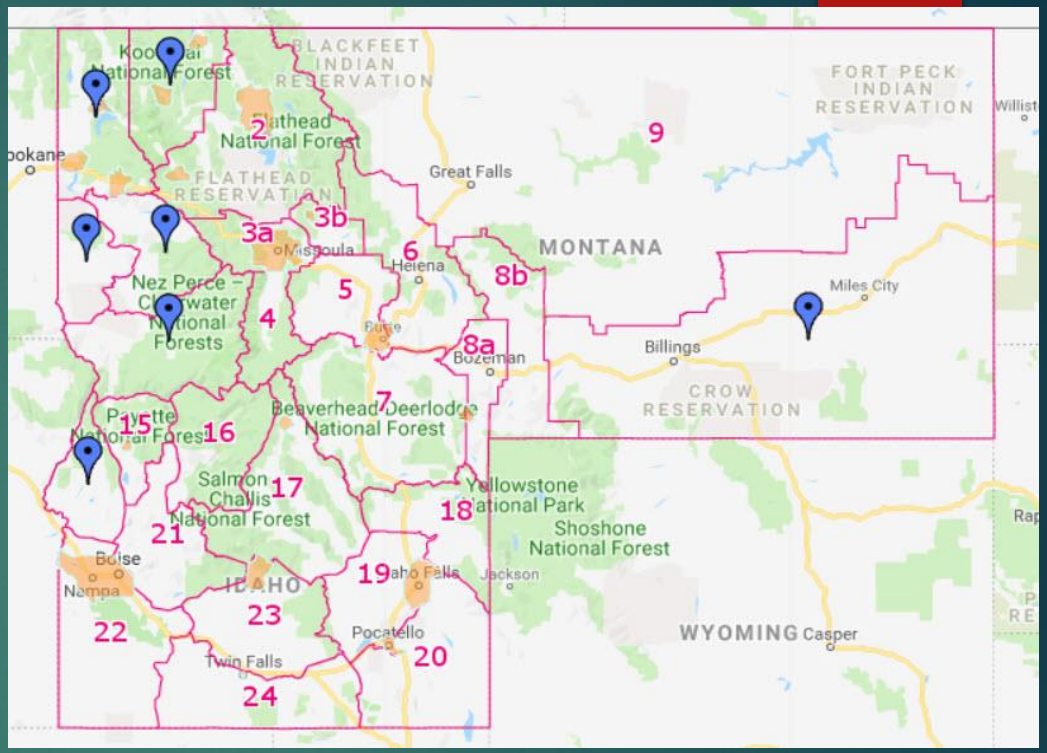
SMOKE



Central Idaho, August 13, 2007

Smoke Dispersion Forecast for Montana/Idaho





- https://mi.airshedgroup.org/

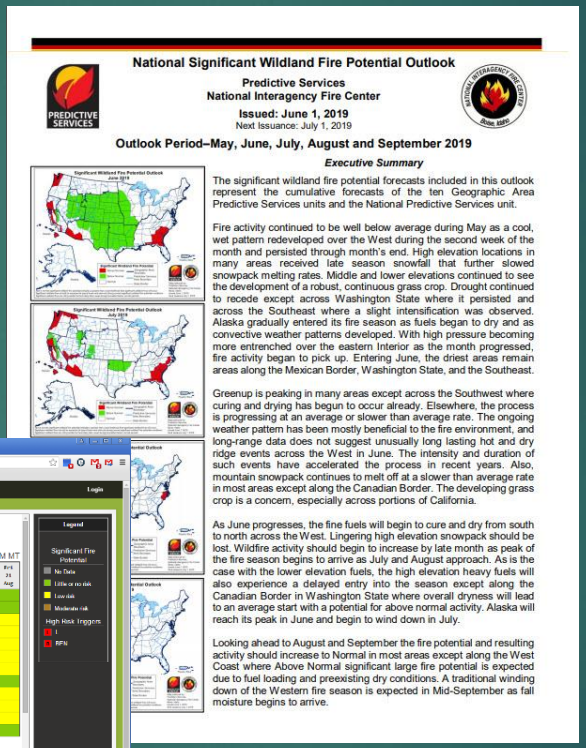
- Discussion of overall weather patterns and trends for decision support, Fall season Sept. 01 – Nov. 30, Spring Season Mar. 01-May 31.

7 day Forecasts for 24 distinct Airsheds and 13 Impact Zones

Wildland Fire Forecasting: Predictive Services Products/ Tools for Decision Support

- Weekly, monthly and seasonal outlooks
- Daily forecasts of critical fire weather and smoke dispersion
- Briefings for multi-level decision support, daily web-briefings
- Fuels and fire behavior advisories
- Research and development
- Teaching/Developing Courses

Wildland Fire Forecasting: Predictive Services Products/ Tools for Decision Support



National Significant Wildland Fire Potential Outlook

Predictive Services
National Interagency Fire Center

Issued: June 1, 2019
Next Issuance: July 1, 2019

Outlook Period–May, June, July, August and September 2019

Executive Summary

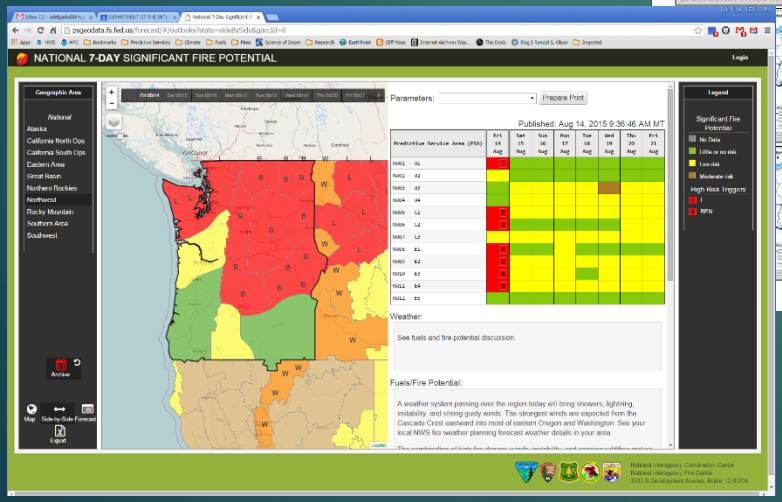
The significant wildland fire potential forecasts included in this outlook represent the cumulative forecasts of the ten Geographic Area Predictive Services units and the National Predictive Services unit.

Fire activity continued to be well below average during May as a cool, wet pattern redeveloped over the West during the second week of the month and persisted through month's end. High elevation locations in many areas received late season snowfall that further slowed snowpack melting rates. Middle and lower elevations continued to see the development of a robust, continuous grass crop. Drought continued to recede except across Washington State where it persisted and across the Southeast where a slight intensification was observed. Alaska gradually entered its fire season as fuels began to dry and as convective weather patterns developed. With high pressure becoming more entrenched over the eastern Interior as the month progressed, fire activity began to pick up. Entering June, the driest areas remain areas along the Mexican Border, Washington State, and the Southeast.

Greenup is peaking in many areas except across the Southwest where curing and drying has begun to occur already. Elsewhere, the process is progressing at an average or slower than average rate. The ongoing weather pattern has been mostly beneficial to the fire environment, and long-range data does not suggest unusually long lasting hot and dry ridge events across the West in June. The intensity and duration of such events have accelerated the process in recent years. Also, mountain snowpack continues to melt off at a slower than average rate in most areas except along the Canadian Border. The developing grass crop is a concern, especially across portions of California.

As June progresses, the fine fuels will begin to cure and dry from south to north across the West. Lingering high elevation snowpack should be lost. Wildfire activity should begin to increase by late month as peak of the fire season begins to arrive as July and August approach. As is the case with the lower elevation fuels, the high elevation heavy fuels will also experience a delayed entry into the season except along the Canadian Border in Washington State where overall dryness will lead to an average start with a potential for above normal activity. Alaska will reach its peak in June and begin to wind down in July.

Looking ahead to August and September the fire potential and resulting activity should increase to Normal in most areas except along the West Coast where Above Normal significant large fire potential is expected due to fuel loading and preexisting dry conditions. A traditional winding down of the Western fire season is expected in Mid-September as fall moisture begins to arrive.



Fuels and Fire Behavior Advisory

West and Central Interior of Alaska

July 9, 2015

Subject: Peak season conditions aggravated by above normal temperature and lack of wetting rain continue to produce very active to extreme fire behavior across a broad area of Interior Alaska.

Discussion: An extreme and extended hot and dry upper level ridge in June lifted fire danger indices to record levels. Despite a couple of marginal precipitation events, fire potential remains very high for Interior Alaska. Weak high pressure is expected to dominate the Interior through much of July, keeping dry conditions in place.

Precipitation in this area is well below average this summer. Lack of wetting rain has caused DMC (Duff Moisture Code) and BUI (Buildup Index) values to rise to very high levels across the area. This is an indicator that large amounts of live and dead vegetation as well as duff and organic soil are available to burn. Under these conditions black spruce will burn aggressively with torching, spotting and active crown fire. Tundra and mixed stands of spruce and hardwoods are available to burn. Hardwoods may slow but will not stop fire spread.

Difference from normal conditions: The dry early spring led to an extended period of hot, dry weather through the month of June. Recent precipitation gave some relief to South Central and east-central Alaska, but a large area of the Interior remains extremely dry. Fire intensity in the area is no longer influenced by fine dead fuels alone but all size classes are contributing to combustion and spread. In many cases, live fuels are no longer serving as a heat sink, but rather contributing to intensity and spread. Fires are very persistent and difficult to contain because deeper duff layers are dry, allowing fire to entrench and hold in organic soils. Approximately 300 fires are now active across the state and the number will increase as warm, dry weather continues.

Concerns to Firefighters and the Public:

- Peak fire season conditions even drier than normal, resulting in extreme ignition potential, rapid fire growth under even low wind conditions, and prolific spotting from torching spruce.
- Deeper burning may produce hidden ash pits, holdover fire, and heavy smoke.
- Thunderstorm winds can cause fires to change direction, increase burning intensity, and produce extreme fire behavior.
- Lightning that can threaten exposed locations.
- Numerous large fires burning in flashy tundra fuels with potential to burn together.
- Extended active burning periods due to long hours of sunlight.

Mitigation Measures:

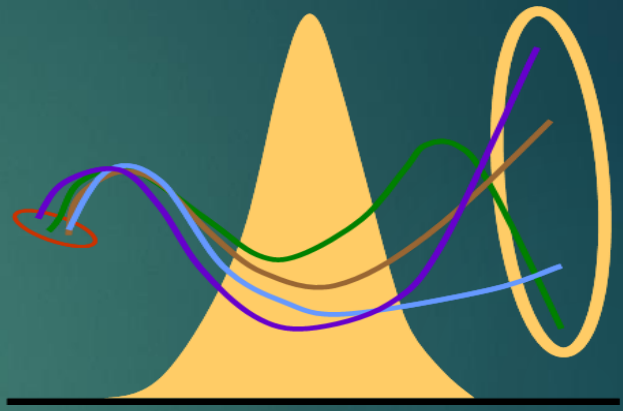
- Keep updated weather forecasts in hand and in mind when attacking fires.
- Ensure that briefings highlight the unusually warm and dry weather that is creating very low fine fuel moisture and deep drying in duff fuels.
- Emphasize to initial attack personnel the need for secure anchor points as well as accessible and effective safety zones. Periodically reassess escape routes and location of safety zones.
- Post lookouts and watch for towering cumulus around the fire to anticipate windshifts and gusts.
- Warn the public to anticipate surprisingly easy ignition of fuels around their houses and the difficulty stopping them once they start.

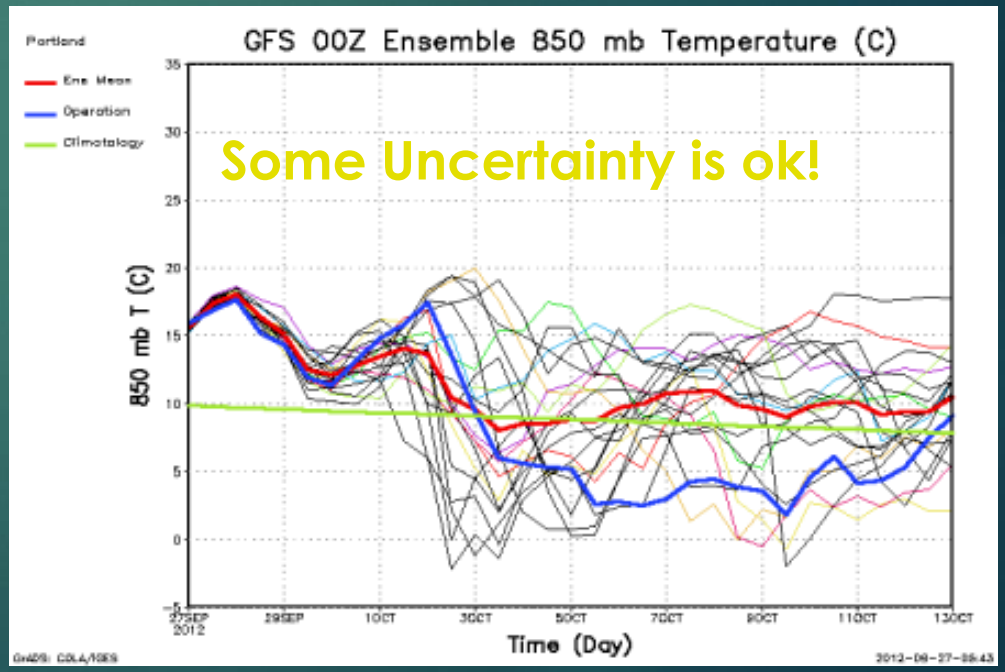
Area of Concern: West and Central Interior of Alaska

Predictive Services: Strader/Ziel

PREDICTIVE SERVICES

Wildland Fire Forecasting: How Fire Weather is Changing





INCREASINGLY IMPORTANT FACTOR NOW, CLIMATE WARMING/DE-STABILIZATION

Are weather patterns in the NRGA changing?

YES!

https://gallery.mailchimp.com/daf3c1527c528609c379f3c08/files/82234023-0318-408a-9905-5f84bbb04eee/Climate_Statement_2018.pdf

How Fire Weather Forecasting Has Changed in Recent Years

Changing Climate: INCREASINGLY WARMER IN JULY

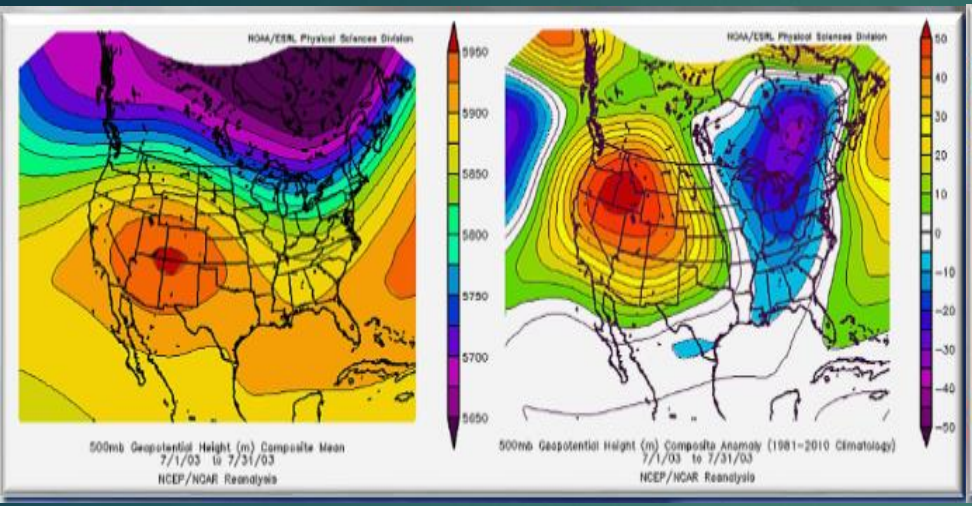
Mean July Max/Min Temps and Precipitation

Climatological Period of Record	Missoula	Helena	Billings	Miles City
1971-2000	84/50 1.09	83/52 1.34	86/58 1.28	88/60 1.61
1981-2010	86/51 0.99	86/54 1.19	87/59 1.32	88/60 1.64
1998-2018	**88/53** **0.71**	**88/56** **0.82**	**89/60** **0.88**	**91/62** **1.19**

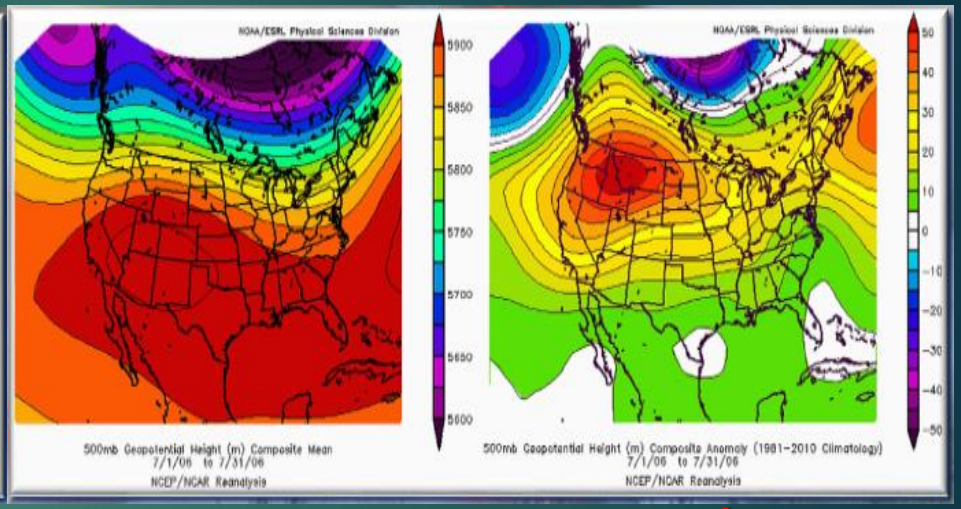
DRIVER OF EXTREME FIRE SEASONS

Multi-day periods of warm/dry/poor RH recoveries on slopes/ridges

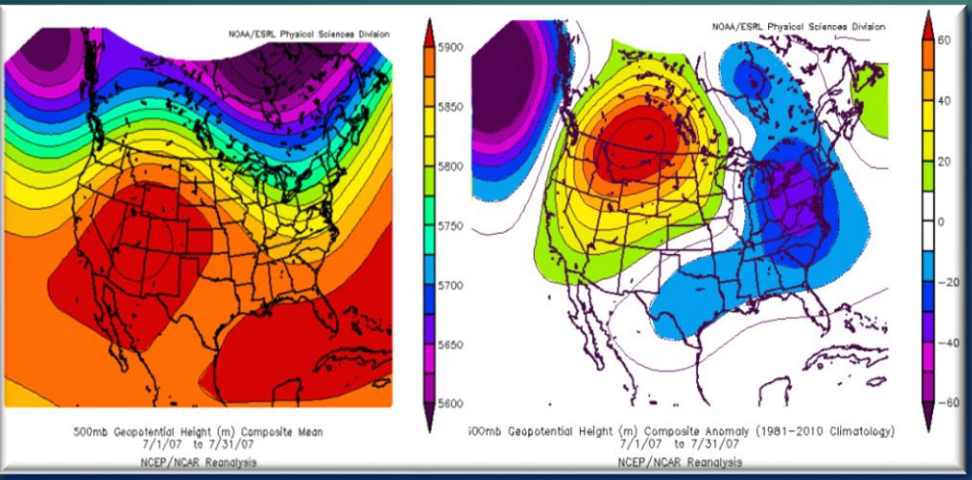
RAPID AND SUSTAINED FUELS DRYING = Drought Stress



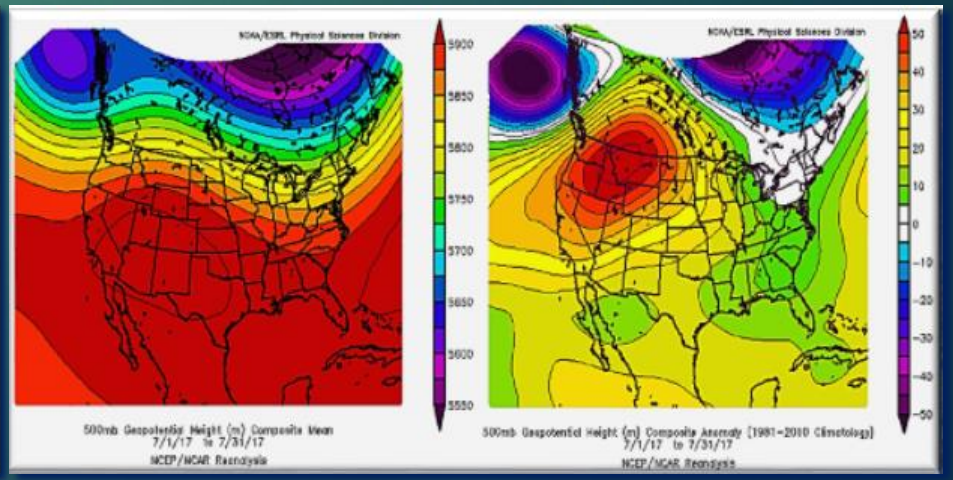
July 2003 Mean Upper Air Pattern/Anomalies



July 2006 Mean Upper Air Pattern/Anomalies



July 2007 Mean Upper Air Pattern/Anomalies



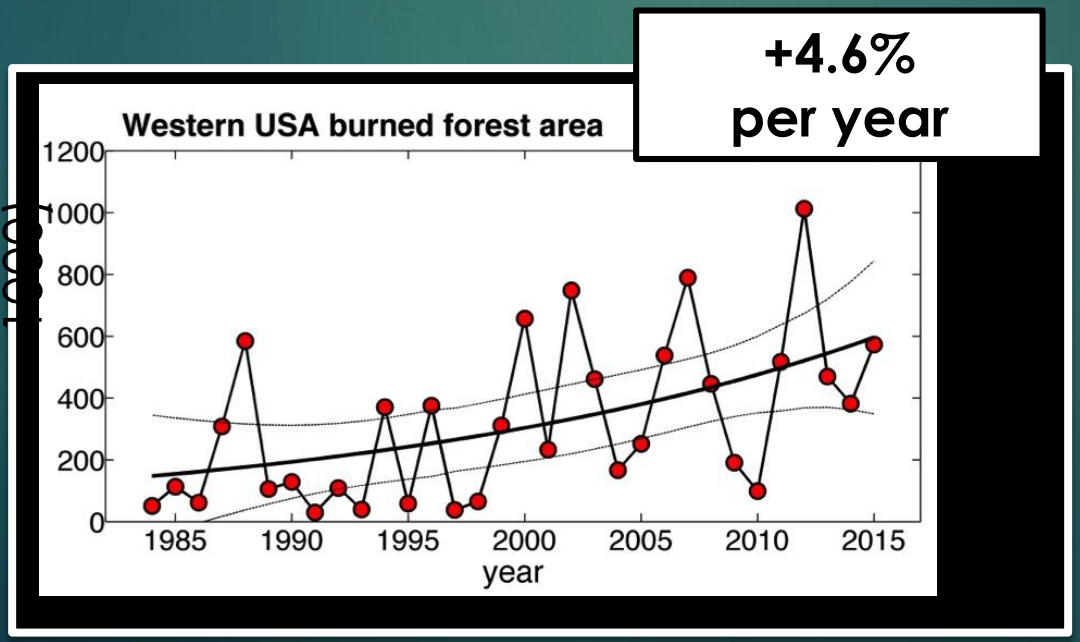
July 2017 Mean Upper Air Pattern/Anomalies

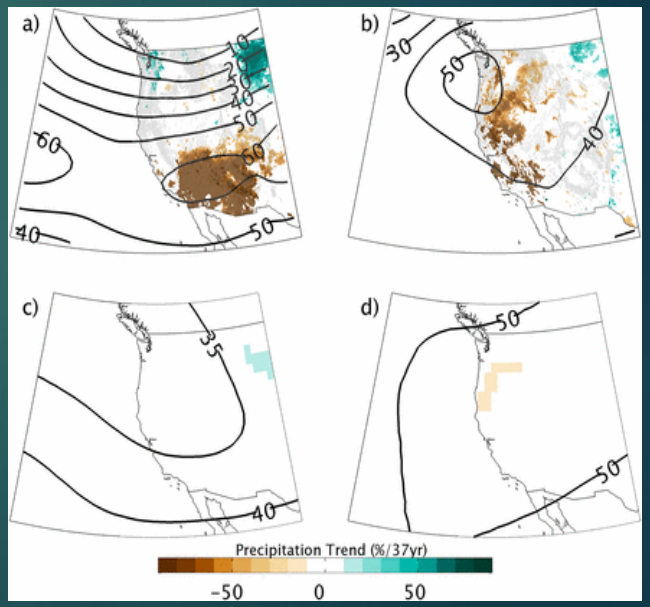
IMPACTS: Williams and Abatzoglou, 2016
Overall Increase in Wildland Fire in the Western U.S., Fire Seasons 78 Days Longer on Average Since 1970

NRGA Trend Matches This

"Anthropogenic climate change accounted for ~55% of observed increases in fuel aridity from 1979 to 2015 across western US forests, highlighting both anthropogenic climate change and natural climate variability as important contributors to increased wildfire potential in recent decades. "

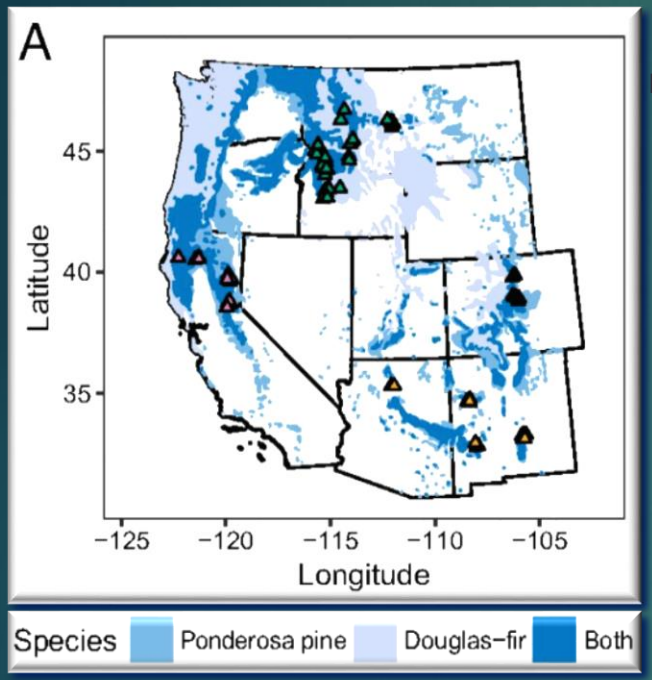
Trend in Spring/Summer Jet Stream. Weaker Low Pressure Troughs/*Stronger Ridging*.

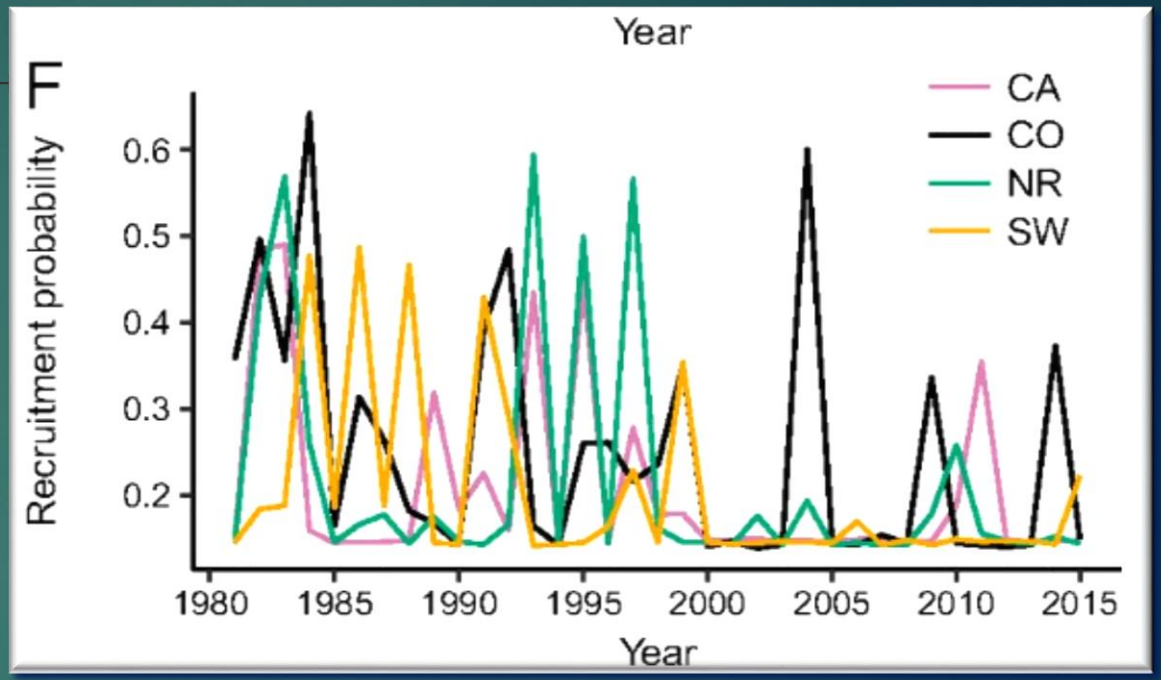




Williams & *Abatzoglou*
2016*Climate Change Report*

IMPACTS: Davis, et al March, 2019
Wildfires and climate change push low-elevation forests across a critical climate threshold for tree regeneration





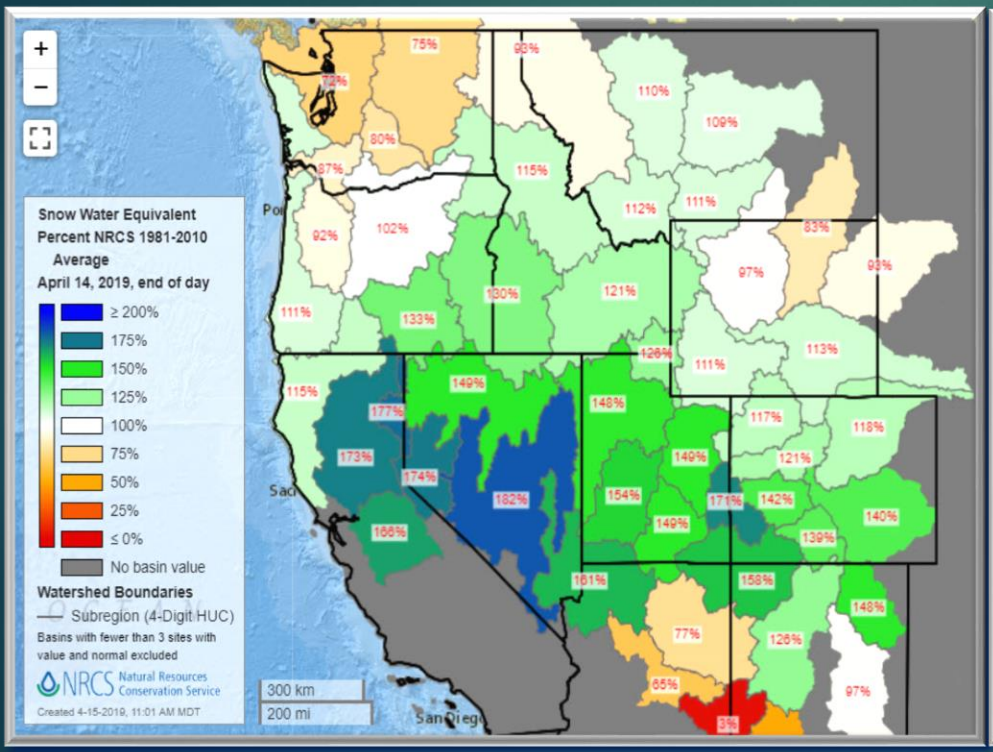
To isolate the effect of annual climate, we accounted for the effect of other drivers of postfire regeneration, including fire severity and distance to seed source. Our results demonstrate threshold responses of annual tree recruitment to vapor pressure deficit (VPD), surface temperature, and soil moisture.

***Climate conditions in the low-elevation forests we sampled have repeatedly crossed these thresholds over the past 20 yrs, revealing a decline in the climate suitability for postfire tree regeneration across broad regions of the western United States.* These findings imply that increased frequency of stand-replacing fires could initiate abrupt ecosystem transitions in low-elevation ponderosa pine and Douglas-fir forests.**

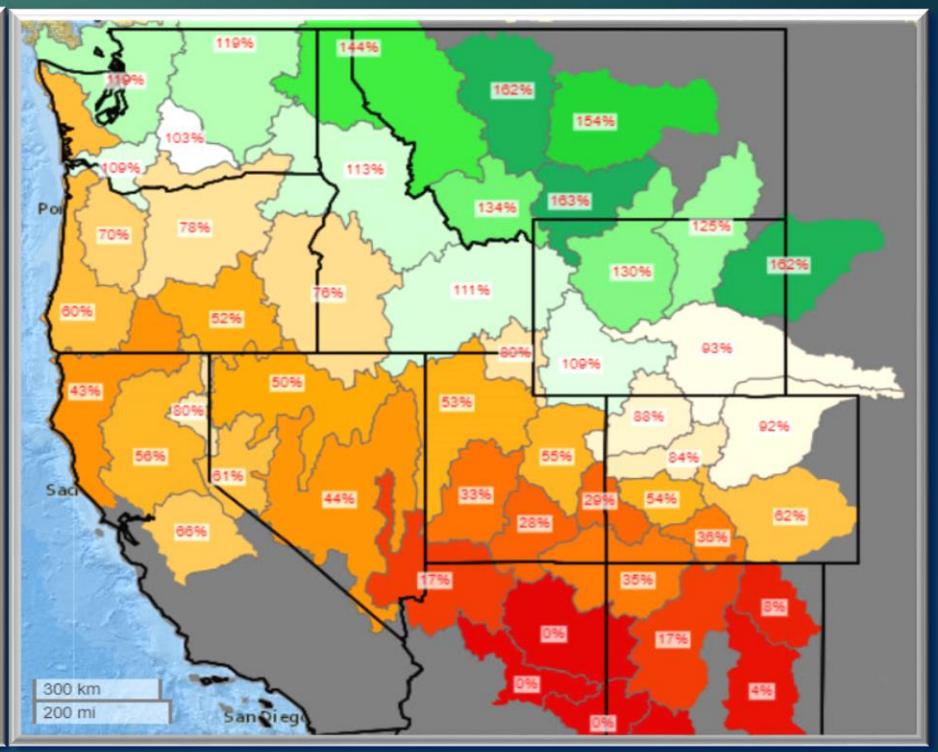
https://www.pnas.org/content/116/13/6

Emphasis on Snowpack Has Changed More Importantly How it Melts Off

Seasonal Trends – Water Year Snowpack

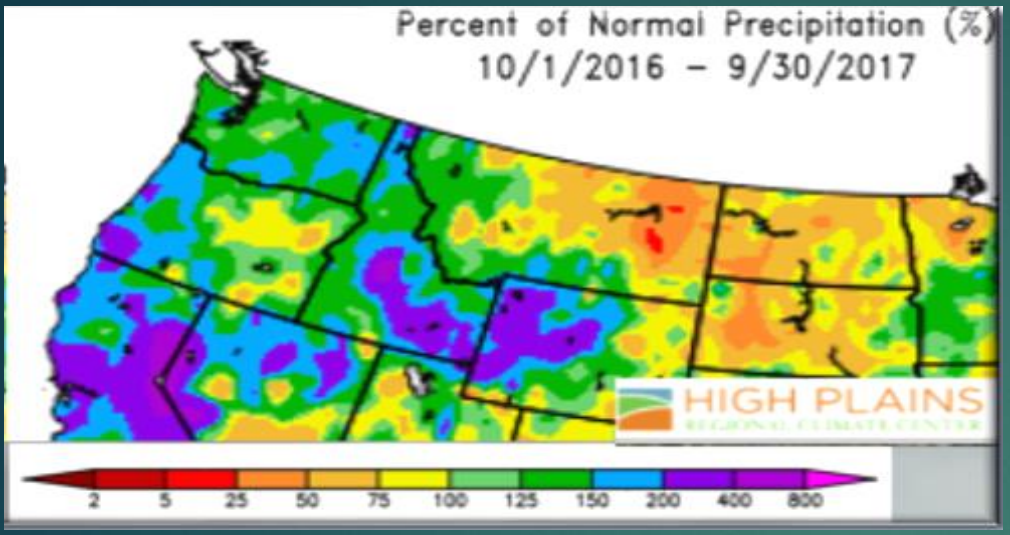


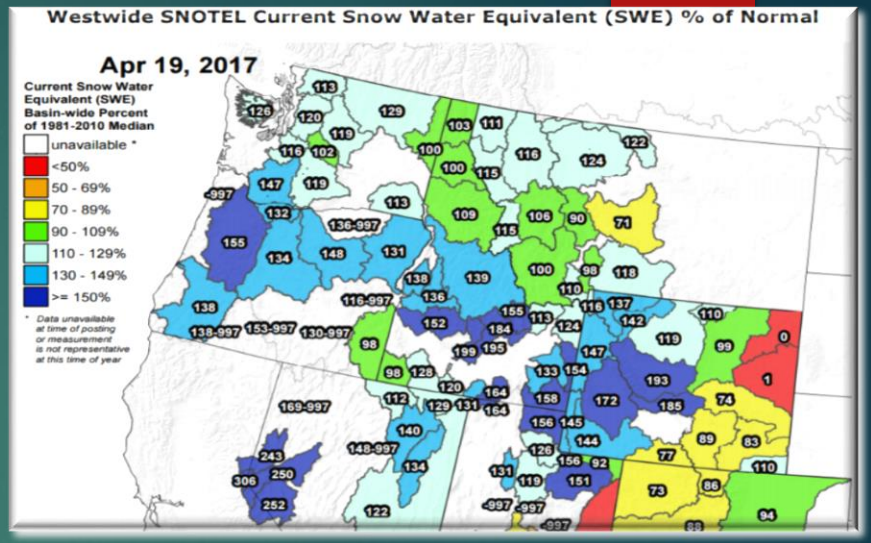
April 2019



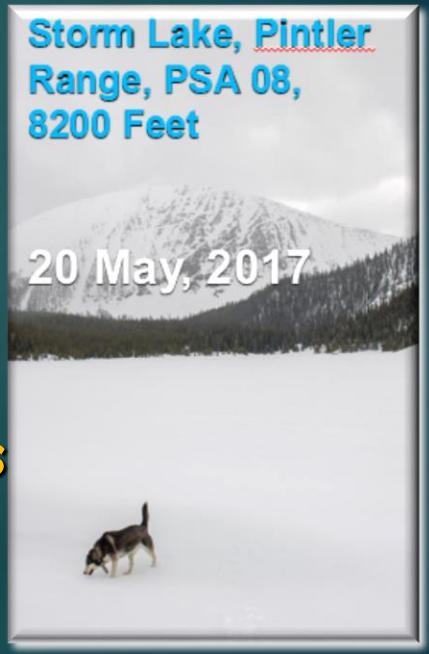
April 2018

What Happened in 2017 ?





Cool, moist fall/winter into spring, North ID/Western MT. Above-average snowpacks. Dry late winter/spring Central MT east into North Dakota, drought conditions there beginning in April.

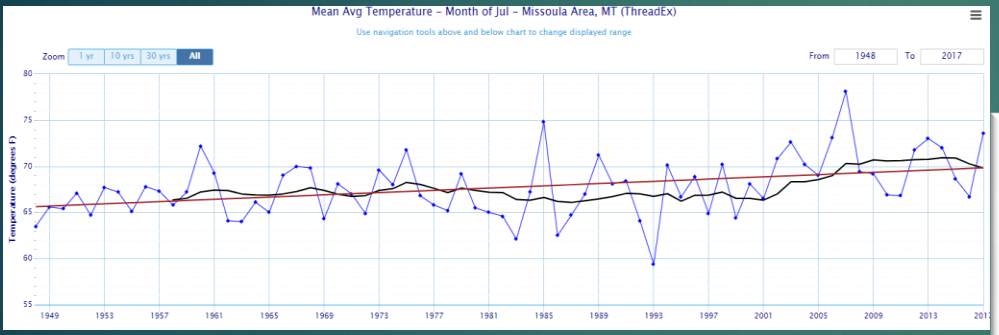


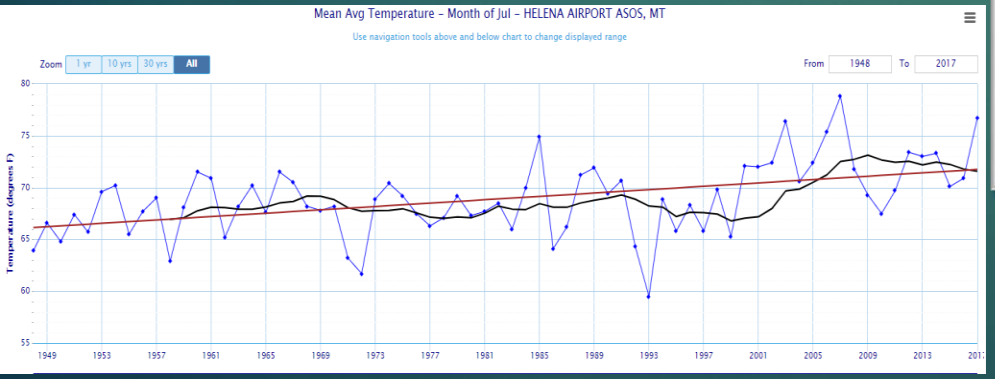
Climate outlooks forecast near-average summer temperatures (July/August) and precipitation even as late as early June.

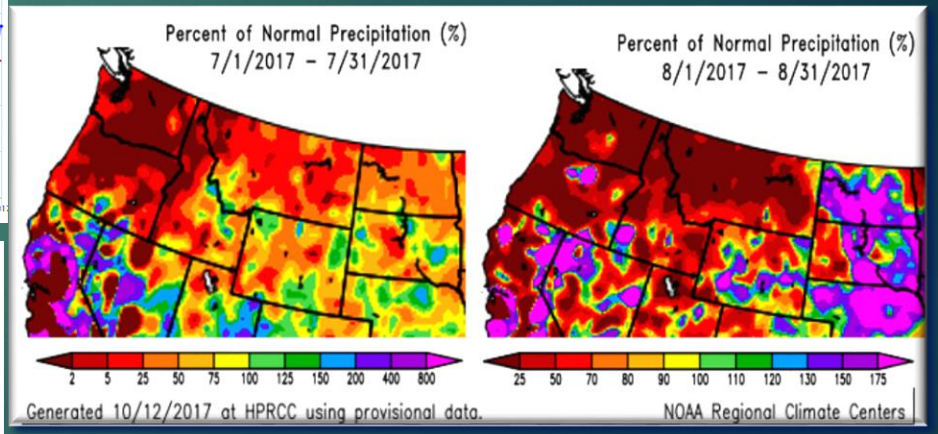
What Happened in 2017 ?

FLASH DROUGHT **mid June-mid September, focused over Western PSAs. Driest summer ever many locations.** ***First ever July in Missoula with no measurable rainfall. Caused by the exceptionally strong ridging present. Dry Lightning episodes in Late June and mid July provided plentiful ignitions east into Central Montana.***

2nd or 3rd Warmest Summer most North ID/Montana locations, after 2007. Rapid and Sustained fuels drying at middle and higher elevations.

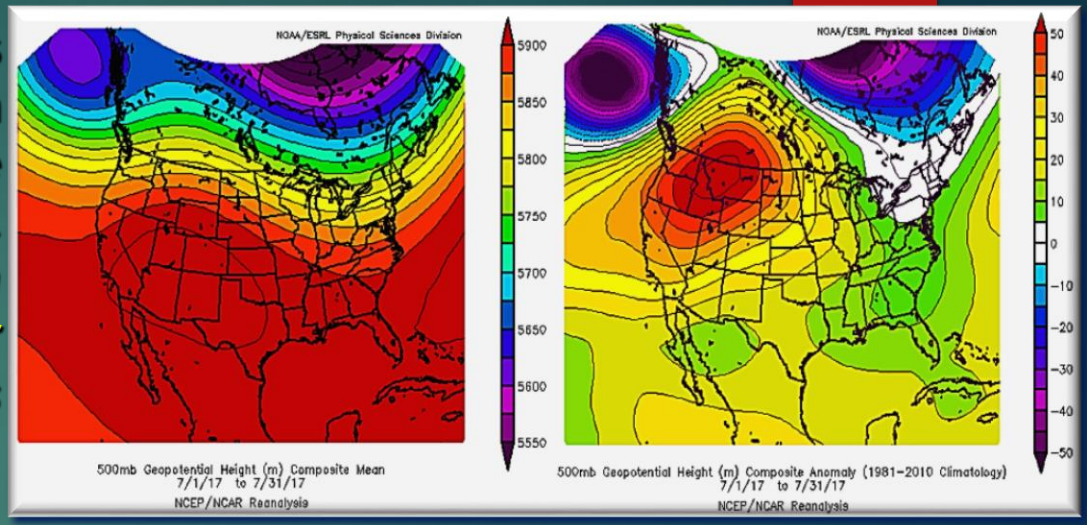




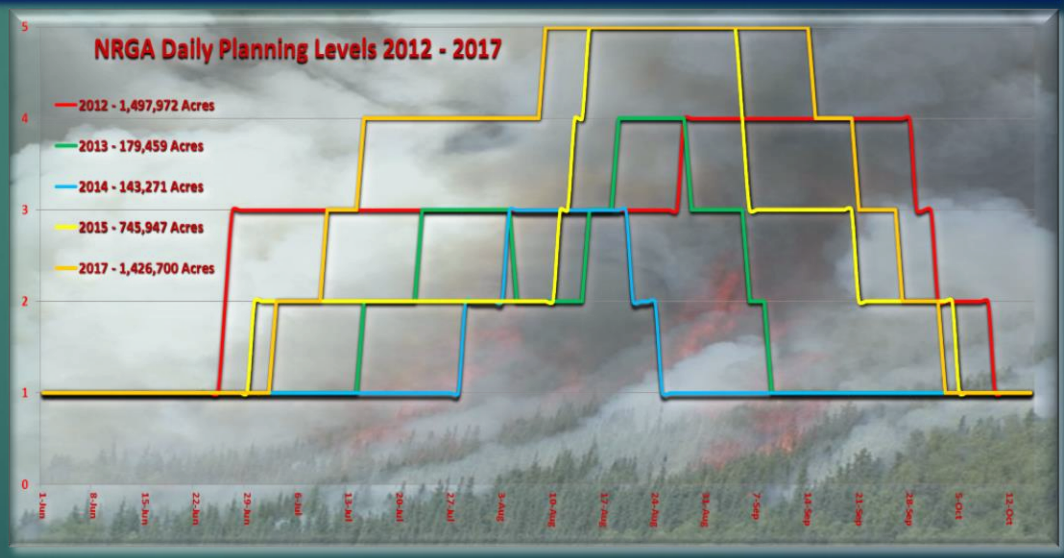


What Happened in 2017 ?

Exceptionally strong 4-Corners upper high expanded much further north than usual in late June and persisted into early August. ***Very low RHs for long periods in thermal belts/exposed higher terrain. Rapid and sustained fuels drying.***



Greatest July 500mb positive height anomalies in North America were centered over NRGA.



Suppressed convection somewhat over North ID/Western MT, but not over SW MT and Yellowstone NP, monsoon moisture pulses with *wet convection* kept fuel moistures higher there ***(only PSAs in NRGA that verified spring season outlooks!)***.

Preceded by on-going spring/early summer drought Central Montana east into North Dakota. Result: PL4/5 from 15 July – 20 September.

Coordination/Collaboration ?

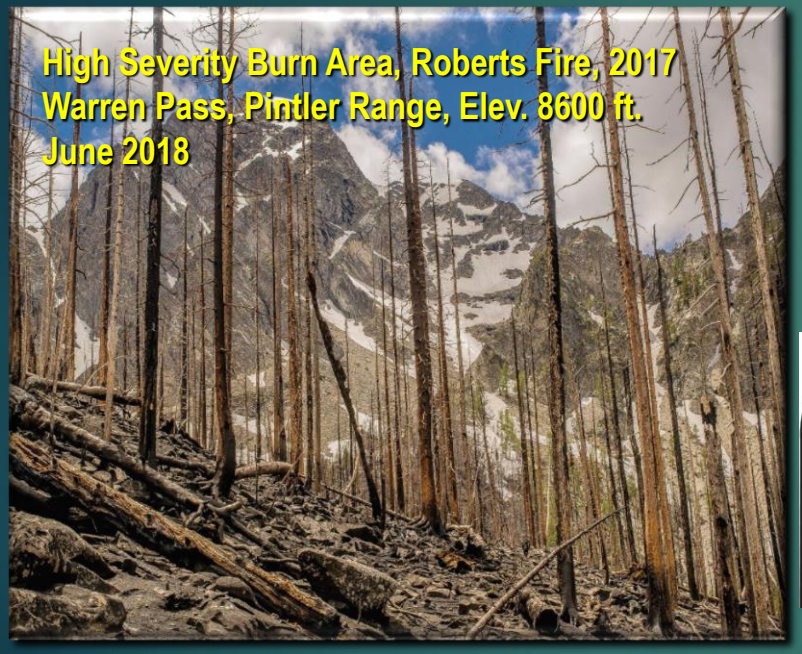
NRCC "Family" is interagency. Roy and Ross from DNRC
Good working relationship with John Monzie and his team
Other opportunities are encouraged

- NWS Forecast Offices, IMETS, SPC
- USFS Remote Sensing Applications Center (RSAC)
- USFS Research Stations – Such as Missoula Fire Lab WFAS
- Wildland Fire Management – Research, Development & Application (WFM RD&A)
- Desert Research Institute (DRI)
- University of Utah - MESOWest
- JFSP's Fire Science Exchange Network

NRCC
Northern Rockies Coordination Center

Thank You

https://gacc.nifc.gov/nrcc/index.htm



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